What Is Claimed Is:

1. A method for producing an unsaturated carboxylic acid, which comprises subjecting a mixture of an alkene and an alkane to a single-pass vapor phase catalytic oxidation reaction in the presence of a catalyst containing a mixed metal oxide having the formula

$$A_aM_mN_nX_xO_o$$

wherein A is at least one element selected from the group consisting of molybdenum and tungsten, M is at least one element selected from the group consisting of vanadium and cerium, N is at least one element selected from the group consisting of tellurium and selenium, and X is at least one element selected from the group consisting of niobium, tantalum, titanium, aluminum, zirconium, chromium, manganese, iron, ruthenium, cobalt, rhodium, nickel, platinum, bismuth, boron, indium, arsenic, germanium, tin, lithium, sodium, potassium, cesium, francium, beryllium, magnesium, calcium, strontium, barium, hafnium, lead, phosphorus, promethium, europium, gadolinium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, gold, silver, palladium, gallium, zinc, praseodymium, rhenium, iridium, neodymium, yttrium, samarium and terbium; and

wherein when a = 1, m = 0.01 to 1.0, n = 0.01 to 1.0, x = 0.01 to 1.0 and o is dependent on the oxidation state of the other elements.

2. The method according to claim 1, wherein as a starting material gas to be supplied to the reaction system, steam is used together with the mixture of alkene and alkane.

3. The method according to claim 2, wherein as starting material gases to be supplied to the reaction system, oxygen and a diluting gas are used together with the mixture of an alkene and an alkane and steam; and wherein the molar ratio of the mixture of (alkene and alkane) : (oxygen) : (diluting gas) : (steam) in the starting material gas is (1) : (0.1 to 10) : (0 to 20) : (0.2 to 70).

4. The method according to claim 1, wherein the mixed metal oxide exhibits X-ray diffraction peaks at the following diffraction angles 2θ in the X-ray diffraction pattern using Cu-Kα radiation:

Diffraction angle 2θ (±0.3°)
22.1°,
28.2°,
36.2°,
45.2°,
50.0°.

5. The method according to claim 1, wherein M is vanadium.

6. The method according to claim 5, wherein N is tellurium.

7. The method according to claim 6, wherein X is niobium.

8. The method according to claim 1, wherein the alkene is propene and the alkane is propane.

9. The method according to claim 8, wherein the alkene is present in an amount of at least 0.5 % by weight up to 10 % by weight.

10. A method for producing an unsaturated nitrile, which comprises subjecting a mixture of an alkene, an alkane and ammonia to a vapor phase catalytic oxidation reaction in the presence of a catalyst containing a mixed metal oxide having the formula

$$A_aM_mN_nX_xO_o$$

wherein A is at least one element selected from the group consisting of molybdenum and tungsten, M is at least one element selected from then group consisting of vanadium and cerium, N is at least one element selected from the group consisting of tellurium, antimony and selenium, and X is at least one element selected from the group consisting of niobium, tantalum, titanium, aluminum, zirconium, chromium, manganese, iron, ruthenium, cobalt, rhodium, nickel, platinum, antimony, bismuth, boron, indium, arsenic, germanium, tin, lithium, sodium, potassium, rubidium, cesium, francium, beryllium, magnesium, calcium, strontium, barium, hafnium, lead, phosphorus, promethium, europium, gadolinium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium, gold,

silver, palladium, gallium, zinc, praseodymium, rhenium, iridium, neodymium, yttrium, samarium and terbium; and

wherein when a = 1, m = 0.01 to 1.0, n = 0.01 to 1.0, x = 0.01 to 1.0 and o is dependent on the oxidation state of the other elements.

11. The method according to claim 10, wherein the mixed metal oxide exhibits X - ray diffraction peaks at the following diffraction angles 2θ in the X - ray diffraction pattern using Cu-Kα radiation:

Diffraction angle 2θ (±0.3°)
22.1°
28.2°
36.2°
45.2°
50.0°.

12. The method according to claim 10, wherein the alkene is propene and the alkane is propane.